

----- GENERAL INFORMATION -----

DATA TITLE: Raman spectroscopy analysis of cross-sectioned ferritic Cr-Mo-V steel T91 (UNS: K90901) after oxidation at 1200 C for 2 h in air and steam

DATA ABSTRACT: Images of intensity filter maps set to specific Raman shifts, generated from Raman spectroscopy, illustrating the distribution of oxidation products in cross-sectioned segments of ferritic Cr-Mo-V steel T91 (UNS: K90901) after oxidation at 1200 C for 2 h in steam and air.

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ASSOCIATED PUBLICATIONS:

T. Copeland-Johnson, C.K.A. Nyamekye, S.K. Gill, L. Ecker, N. Bowler, E.A. Smith, R.B. Rebak, Characterization of Kanthal APMT and T91 oxidation at beyond design-basis accident temperatures, Corros. Sci. (2020).

COLLECTION INFORMATION:

Time period(s): 2017-2019

Location(s): Iowa State University, Brookhaven National Laboratory

----- FILE DIRECTORY -----

----- FILE LIST-----

File Name	Description
Raman_T91_Air_Image.png	Optical micrograph image taken by Raman microscope from alloy T91 after oxidation in air
Raman_T91_Air_Cr2O3.png	Raman intensity filter map illustrating the distribution of Cr ₂ O ₃ (Eskolaite) set to 543 cm ⁻¹ in Raman_T91_Air_Image.png
Raman_T91_Air_FeCr2O4.png	Raman intensity filter map illustrating the distribution of Fe _(3-x) Cr _x O ₄ (Spinel) set to 677 cm ⁻¹ in Raman_T91_Air_Image.png
Raman_T91_Steam_Image.png	Optical micrograph image taken by Raman microscope from alloy T91 after oxidation in steam

Raman_T91_Steam_Fe2O3.png	Raman intensity filter map illustrating the distribution of α -Fe ₂ O ₃ set to 502 cm ⁻¹ in Raman_T91_Steam_Image.png
Raman_T91_Steam_FeCr2O4.png	Raman intensity filter map illustrating the distribution of Fe _(3-x) Cr _x O ₄ set to 677 cm ⁻¹ in Raman_T91_Steam_Image.png

METHODS AND MATERIALS -----

----- DATA COLLECTION METHODS -----

The Horiba XploRA Plus Raman microscope is used for capturing Raman images. A Raman spectrum is acquired at each and every pixel of the image (i.e. point-by-point mapping). Signal was collected in the epi-direction using a 300 μ m confocal pinhole and an 1800 g/mm grating with 3 cm⁻¹ resolution. The specimens were placed onto a glass slide and irradiated with a 1.44×10^5 W cm⁻² solid-state 532-nm diode laser producing a 2.95 ± 0.06 μ m laser spot size on the specimen surface. The cross-sectioned specimens were analyzed with an Olympus 50 \times objective (0.50 numerical aperture). A 60 s acquisition time with three accumulations were used for all Raman measurements. The 532 nm laser is focused at a spot on the sample, moved by a motorized stage at a step size of 2 μ m. The false color images of the Raman maps are functions of the Raman shift, image size (XY dimension) and the color amplitude scale represents the Raman peak intensity which can provide information about the concentration and/or distribution of the vibrational mode of interest.

----- DATA PROCESSING METHODS -----

----- EQUIPMENT -----

Manufacturer: HORIBA Scientific

Model: XploRA™ Plus

Embedded Software/Firmware Name: (if applicable) N/A

Embedded Software/Firmware Version: (if applicable) N/A

Additional Notes: Microscope equipped with a Synapse EMCCD camera, also manufactured by HORIBA scientific

----- LICENSING -----

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